A Compact, Light-weight, Reliable and Highly Efficient Heat Pump for Space Applications, Phase II

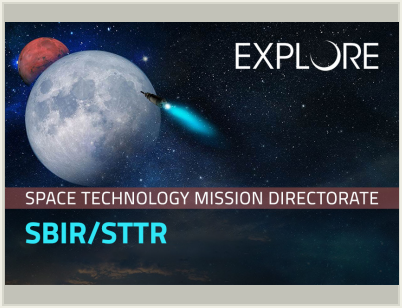
Completed Technology Project (2005 - 2006)

Project Introduction

Extra-vehicular activities (EVA) on the Moon and Mars will require suits with sophisticated thermal control systems allowing astronauts to work for extended periods of time. Use of consumables such as water that cannot be easily replaced should be of particular concern. In this aspect the EVA suits for Moon/Mars environments need to be different from the current Space Shuttle Extra Vehicular Mobility Units (EMU) that require water sublimation into space for removing heat. Moreover, both the Moon and Martian environments are quite different from what conventional EMUs are exposed to. These variations call for careful analysis and innovative engineering for design and fabrication of an appropriate thermal control system. Rini Technologies, Inc. (RTI) proposes a novel and No/Low consumable approach to this problem. With the feasibility of the RTI Miniature Vapor Compression Cycle (MVCC) design demonstrated in Phase I, this proposal explores the development of a novel MVCC system suitable for these rigorous environmental requirements. In Phase II, RTI will build a compact prototype MVCC system capable of providing 250W of cooling while using 75W of electrical power. Furthermore, the system will achieve TRL 4 prior to the completion of the research activity

Anticipated Benefits

Potential NASA Commercial Applications: The MVCC system is far reaching in the possible non NASA applications. Specifically, in military and Homeland Security applications, the system can be implemented as a personal cooling device for use with highly insulative garments such as Chem-Bio suits. In medical applications, the system may be applied to individuals with Chronic Metabolic disorders such as Multiple Sclerosis where thermal regulatory capabilities are diminished. In electronics applications the System can be applied for active thermal management of the environment as well as high heat point source devices.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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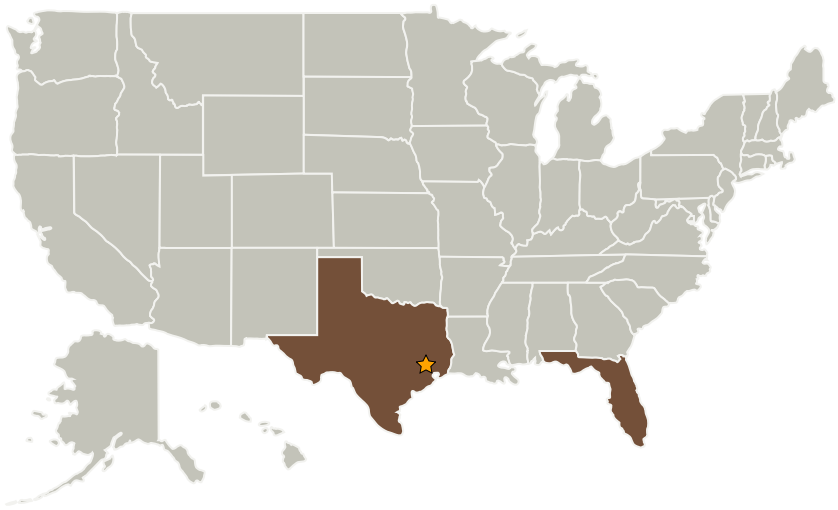
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Rini Technologies, Inc.	Supporting Organization	Industry	Orlando, Florida
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations	
Florida	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Daniel Rini

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.2 Portable Life Support System